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10/554,242	10/25/2005	Shigeru Yamago	2005-1665A	6569

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EXAMINER

BERNSHTEYN, MICHAEL

ART UNIT PAPER NUMBER

1713

DATE MAILED: 09/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/554,242

Applicant(s)

YAMAGO ET AL.

Examiner

Michael Bernshteyn

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 10/25/2005.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites the limitation "obtainable" in the line 1. There is insufficient antecedent basis for this limitation in the claim.

The claim is indefinite if undue experimentation is involved to determine boundaries of protection. This rationale is applicable to polymer "obtainable" by a stated process because any variation in any parameter within the scope of the claimed process would change the polymer produced. One who made or used a polymer made by a process other than the process cited in the claim would have to produce a polymer using all possible parameters within the scope of the claim, and then extensively analyze each product to determine if this polymer was obtainable by a process within the scope of the claimed process. See *Ex parte Tanksley*, 26 USPQ 2d 1389.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 1-5 are rejected under 35 U.S.C. 102(a) as being anticipated by Goto et al. ("Mechanism-Based Invention of High-Speed Living Radical Polymerization Using

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Organotellurium Compounds and Azo-Initiators", Journal of the American Chemical Society, 2003, 125, 8720-8721).

With regard to the limitation of claims 1-5, Goto discloses organotellurium-mediated living radical polymerization (TERP) of styrene, acrylate, and methacrylate derivatives in the presence of 2,2'-azobisisobutyronitrile (AIBN) or 2,2'-azobis(2,4,4-trimethylpentane) as a radical source. Such polymerization process can be completed within 2-11 h and 40-60°C and gives the desired polymers with the expected molecular weight and narrow molecular weight distribution (page 8720, left column, 2<sup>nd</sup> paragraph). The results are in the table 1 (page 8721):

Table 1. Polymerization with 4 in the Presence of AIBN

entry	monomer <sup>a</sup>	method <sup>b</sup>	conditions (°C/h)	yield (%)	M <sub>n</sub> <sup>c</sup>	PDI <sup>d</sup>
1	St	A	60/11	94	11300	1.17
2	St	A <sup>e</sup>	60/11	82	4300	1.11
3	St	A <sup>e</sup>	40/23	82	7400	1.21
4	St	B	100/16	96	9200	1.17
5	BA	A	60/4	99	15900	1.19
6	BA	B	100/24	89	10300	1.13
7	MMA	A	60/2	93	11000	1.36
8 <sup>f</sup>	MMA	A	60/2	98	9600	1.15
9 <sup>g</sup>	MMA	B	80/13	92	9700	1.15
10 <sup>h</sup>	NIPAM	A	60/3	99	30600	1.09
11 <sup>i</sup>	AN	A	60/6	99	37800	1.16
12 <sup>j</sup>	HEMA	A	60/2	99	22300	1.15

<sup>a</sup> St: styrene, BA: *n*-butyl acrylate, MMA: methyl methacrylate, NIPAM: *N*-isopropyl acrylamide, AN: acrylonitrile, HEMA: 2-hydroxyethyl methacrylate. <sup>b</sup> A: A mixture of 4 (1 equiv), AIBN (1 equiv) and monomer (100 equiv) was heated. B: A mixture of 4 (1 equiv) and monomer (100 equiv) was heated. <sup>c</sup> Number-average molecular weight (M<sub>n</sub>) and polydispersity index (PDI) were obtained by size exclusion chromatography calibrated by polySt standards for entries 1-4 and 11 and polyMMA standards for others. <sup>d</sup> Two equivalents of 4 was used. <sup>e</sup> V-70 was used instead of AIBN. <sup>f</sup> Dimethyl ditelluride (1 equiv) was added. <sup>g</sup> Reaction was carried out in DMF.

Goto discloses the usage of **dimethyl ditelluride** compound represented by formula (2) during the polymerization of poly(methyl methacrylate) with low polydispersity (entry 8 in table 1).

Therefore, all the limitations of the claims 1-5 are expressly met by Goto.

2. Claims 1-5 are rejected under 35 U.S.C. 102(a) as being unpatentable as obvious Yamago et al. ("Tailored Synthesis of Structurally Defined polymers by Organotellurium-Mediated Living Radical Polymerization", Journal of American Chemical Society, 2002, 124, 13666-13667) in view of Alger ("Polymer Science Dictionary", 2<sup>nd</sup> Edition", Chapman & Hall, 1997).

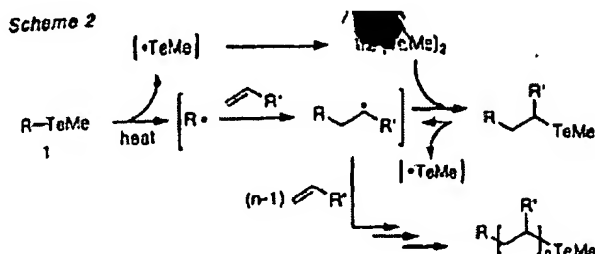
Yamago discloses a highly versatile method for the synthesis of block copolymers based on organotellurium-mediated living radical polymerization (TEPR). TEPR is extremely general and can polymerize different families of monomers, such as styrenes, acrylates, and methacrylates, using the same initiators at a highly controlled manner. Furthermore, the versatility of TEPR allows the synthesis of various AB-, ABA-, and ABC block copolymers starting from a singly monofunctional initiator, regardless of the order of monomer addition (page 13666, 1<sup>st</sup> column, 3<sup>rd</sup> paragraph).

Yamago discloses that the effect of the dimethyl ditelluride strongly suggests that the polymerization proceeds via the ditelluride-capping mechanism as shown in Scheme 2 (see below); the tellurium radical generated by the bond homolysis of 1 forms dimethyl ditelluride, which serves as the capping reagent of the polymer end radicals (page 13667, 1<sup>st</sup> column, 2<sup>nd</sup> paragraph).

Yamago discloses that the TEPR process would be suitable for a tailored synthesis of block copolymers using macroinitiators, because the same initiators can control the polymerization of different types of monomers under similar thermal conditions. ABA and ABC triblock copolymers could also be prepared starting from

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diblock macroinitiators in a highly controlled manner (page 13667, 2<sup>nd</sup> column, 1<sup>st</sup> paragraph).



**Table 2.** Synthesis of AB Di- and ABA Tri- and ABC Triblock Copolymers Using Macroinitiators

entry	macroinitiator <sup>a</sup>	M <sub>n</sub> /PD <sup>b</sup>	monomer <sup>c</sup>	yield (%)	M <sub>n</sub> /PD <sup>b</sup>
<b>AB Diblock Copolymer</b>					
1	PolySt	9000/1.15	MMA <sup>d</sup>	85	13900/1.25
2	PolySt	9000/1.15	tBA	50	11300/1.18
3	PolyMMA	8500/1.12 <sup>e</sup>	St	85	18800/1.13
4	PolyMMA	8500/1.12 <sup>e</sup>	tBA	57	17100/1.11
5	Poly(tBA)	9600/1.10 <sup>e</sup>	St	77	19200/1.32
6	Poly(tBA)	8200/1.19 <sup>e</sup>	MMA <sup>d</sup>	88	19500/1.35
<b>ABA Triblock Copolymer</b>					
7	PolyMMA- <i>b</i> -polySt	18700/1.18	MMA <sup>d</sup>	83	28100/1.22
8	PolyMMA- <i>b</i> -poly(tBA)	11000/1.11	MMA <sup>d</sup>	83	18600/1.30
<b>ABC Triblock Copolymer</b>					
9	PolySt- <i>b</i> -polyMMA	12600/1.30	tBA	32	16100/1.27
10	PolyMMA- <i>b</i> -polySt	19000/1.13	tBA	45	21800/1.18
11	PolyMMA- <i>b</i> -poly(tBA)	11500/1.09	St	69	21600/1.27

<sup>a</sup> The macroinitiator was prepared from 1b and the corresponding monomer according to the conditions shown in Table 1 (see also Supporting Information). <sup>b</sup> Molecular weight (*M<sub>n</sub>*) and polydispersity (PD) were calibrated by size-exclusion chromatography using polySt standards for crude samples. St: styrene. 100 equiv and 200 equiv of monomers were used for the diblock and triblock copolymer synthesis, respectively. <sup>c</sup> 1 equiv of (MeTe)<sub>2</sub> was added. <sup>d</sup> Calibrated using polyMMA standards.

Yamago does not disclose the usage of azo type polymerization initiator.

Alger discloses that azo initiator is well known type of initiator for the polymerization. Azobisbutyronitrile is by far the commonest example, others include azobiscyclohexynitrile and 2,2'-azobis-2,4-dimethylvaleronitrile, etc. (page 35).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate azo type polymerization initiator as taught by Alger in Yamago's polymerization process with new organotellurium-based

initiators with reasonable expectation of success, because "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a spray-dried detergent by mixing together two conventional spray-dried detergents were held to be *prima facie* obvious.). See also *In re Crockett*, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and *Ex parte Quadranti*, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (mixture of two known herbicides held prima facie obvious).

3. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable as obvious over Yamago et al. ("Organotellurium Compound as Novel Initiators for Controlled/Living radical Polymerizations. Synthesis of Functionalized Polystyrenes and End-Group Modifications", Journal of the American Chemical Society, 124 (12), 2874-2875, 2002.02.27) in view of Leonard et al. (4,124,633) and Alger ("Polymer Science Dictionary", 2<sup>nd</sup> Edition", Chapman & Hall, 1997).

With regard to the limitation of claims 1-5, Yamago discloses the advantages of organotellurium compound compounds over nitroxides, e.g., more facile synthesis of



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tailor-made initiators and easy of polymer-end group modifications, would be highly useful in the synthesis and synthetic transformations of these compounds.

Yamago discloses several new organotellurium-based initiators for controlled/living radical polymerization of styrene derivatives that allows accurate weight control with defined end-groups, which can be transformed into a variety of end-group modified polystyrenes (page 2874, 1<sup>st</sup> column, 2<sup>nd</sup> paragraph).

Yamago discloses bulk polymerization of styrene (X=H) with the polymeric-end mimetic initiator 1a (R=Me) initiated the polymerization efficiently, and afforded polystyrene with the predicted molecular weight and low polydispersity ( $M_n = 9200$ , PD = 1.17) in 96% yield (Table 1, entry 1).

Scheme 1

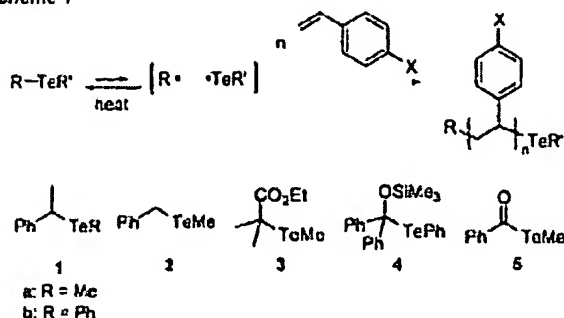


Table 1. Effects of Initiators for Polymerization of Styrene<sup>a</sup>

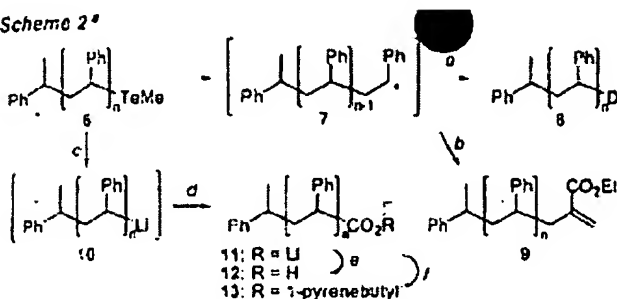
entry	X	initiator	conversion (%)	$M_n^b$	PD <sup>c</sup>	BDE (kJ/mol) <sup>d</sup>
1	H	1a	96	9 200	1.17	123
2	H	1b	91	15 900	1.45	112
3	H	2	89	9 000	1.46	142
4	H	3	79	9 000	1.15	114
5	H	4	76	50 700	1.80	25
6	H	5	83	25 400	1.58	182
7 <sup>e</sup>	H	1a	78	35 700	1.21	
8 <sup>f</sup>	H	1a	84	62 600	1.30	
9	Cl	1a	88 <sup>g</sup>	8 800	1.41	
10	OMe	1a	94 <sup>h</sup>	10 900	1.17	

<sup>a</sup> Bulk polymerization was carried out with 100 equiv of styrene at 105 °C for 16–18 h under a nitrogen atmosphere. <sup>b</sup> Molecular weight ( $M_n$ ) and polydispersity (PD) were calibrated by size exclusion chromatography using polystyrene standards for samples after single precipitation from MeOH. <sup>c</sup> Bond dissociation energy of the initiator obtained by B3LYP DFT calculations with the LANL2DZ basis set for tellurium atom and the 6-31G(d) basis set for the rest. <sup>d</sup> The reaction was carried with 500 equiv of styrene. <sup>e</sup> The reaction was carried out with 1000 equiv of styrene. <sup>f</sup> The reaction was carried out at 100 °C for 17 h. <sup>g</sup> The reaction was carried out at 100 °C for 36 h.

It is the Examiner position, that organotellurium compounds of the above formulas 1a, 1b, 2 are substantially identical to the claimed formula (1).

The initiators 1a and 3 promoted polymerization under much milder conditions. Molecular weight increased linearly with increase of styrene, and the products were obtained with low polydispersity (entries 7 and 8).

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Scheme 2<sup>a</sup>

<sup>a</sup> AIBN (0.1 equiv), Bu<sub>3</sub>SnD (3 equiv), C<sub>6</sub>H<sub>5</sub>CF<sub>3</sub>, 80 °C, 4 h. <sup>b</sup> AIBN (0.1 equiv), ethyl tributylstannylmethacrylate (4 equiv), C<sub>6</sub>H<sub>5</sub>CF<sub>3</sub>, 80 °C, 6 h. <sup>c</sup> BuLi (1.5 equiv), THF, -72 °C, 3 min. <sup>d</sup> CO<sub>2</sub> (excess). <sup>e</sup> Aqueous HCl (excess). <sup>f</sup> 2,4,6-Cl<sub>3</sub>C<sub>6</sub>H<sub>2</sub>COCl (2 equiv), Et<sub>3</sub>N (2 equiv), THF, room temperature, 1.5 h, then 1-pyrenebutanol (4 equiv), DMAP (4 equiv), CH<sub>2</sub>Cl<sub>2</sub>, room temperature, 3 h.

Yamago does not disclose the use of compound represented by the formula (2).

Leonard discloses a process for the preparation of acrylic acid or methacrylic acid, which comprises catalytically decomposing or converting in the presence of tellurium (abstract).

The tellurium catalysts, which may be utilized in the process, are tellurium per se or an organic or inorganic tellurium compound or mixtures thereof.

Representative tellurium catalysts, in addition to tellurium per se include, for example, organic tellurium compounds such as methyl and dimethyl telluride, diphenyl and tetraphenyl telluride, **diphenyl** and **diethyl ditelluride**, dimethyl tellurium dichloride, dibromide, diiodide and difluoride, diphenyl telluroxide, phenyl tellurols and 2-chlorocyclohexyltellurium trichloride, etc., may be employed. The preferred organic tellurium catalysts are **diphenyl telluride** and **ditelluride** (col. 4, lines 4-28).

Both references are analogous art because they are from the same field of endeavor concerning using tellurium derivatives for polymerization process of vinyl monomers.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate tellurium compounds, such as diphenyl and diethyl ditelluride, etc. as taught by Leonard in Yamago's polymerization process of vinyl monomers because any organic or inorganic tellurium salt having an anion, which does not unduly retard the formation of the desired products by an extraneous side reaction can be utilized as a catalyst to decompose the peroxide intermediates (US'633, col. 4, lines 7-11), and thus to arrive at the subject matter of instant claim 1 and dependable claims 2-6 and 13-27.

The combined teaching of Yamago and Leonard does not disclose the usage of azo type polymerization initiator.

Alger discloses that azo initiator is well known type of initiator for the polymerization. Azobisbutyronitrile is by far the commonest example, others include azobiscyclohexylnitrile and 2,2'-azobis-2,4-dimethylvaleronitrile, etc. (page 35).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate azo type polymerization initiator as taught by Alger in Yamago and Leonard's polymerization process with new organotellurium-based initiators with reasonable expectation of success, because "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a

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spray-dried detergent by mixing together two conventional spray-dried detergents were held to be *prima facie* obvious.). See also *In re Crockett*, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and *Ex parte Quadranti*, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (mixture of two known herbicides held *prima facie* obvious).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Bernshteyn whose telephone number is 571-272-2411. The examiner can normally be reached on M-F 8-5:30.

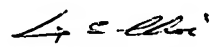
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael Bernshteyn  
Patent Examiner  
Art Unit 1713

MB  
09/12/2006

  
**LING-SUI CHOI**  
**PRIMARY EXAMINER**